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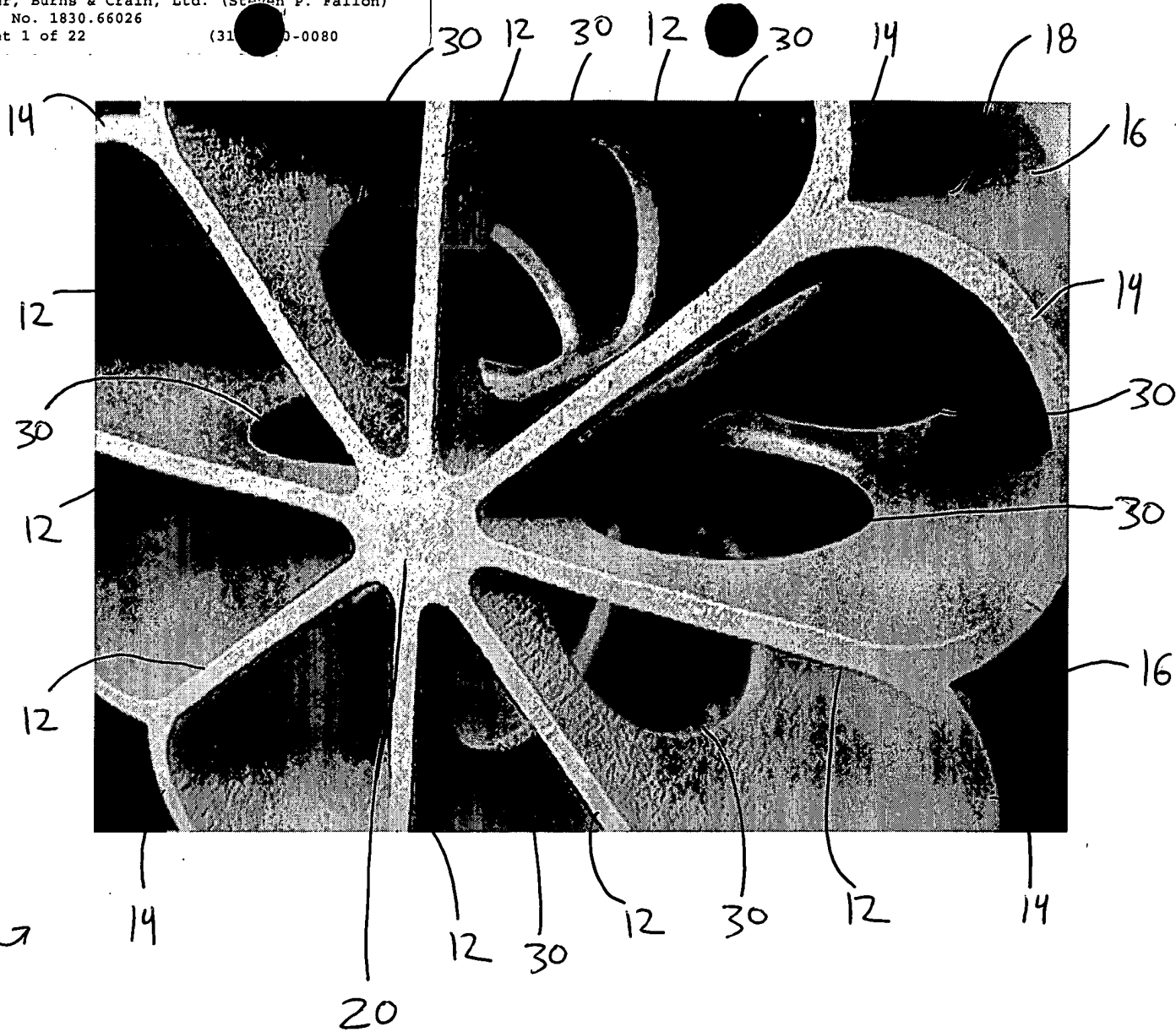


FIG. 1

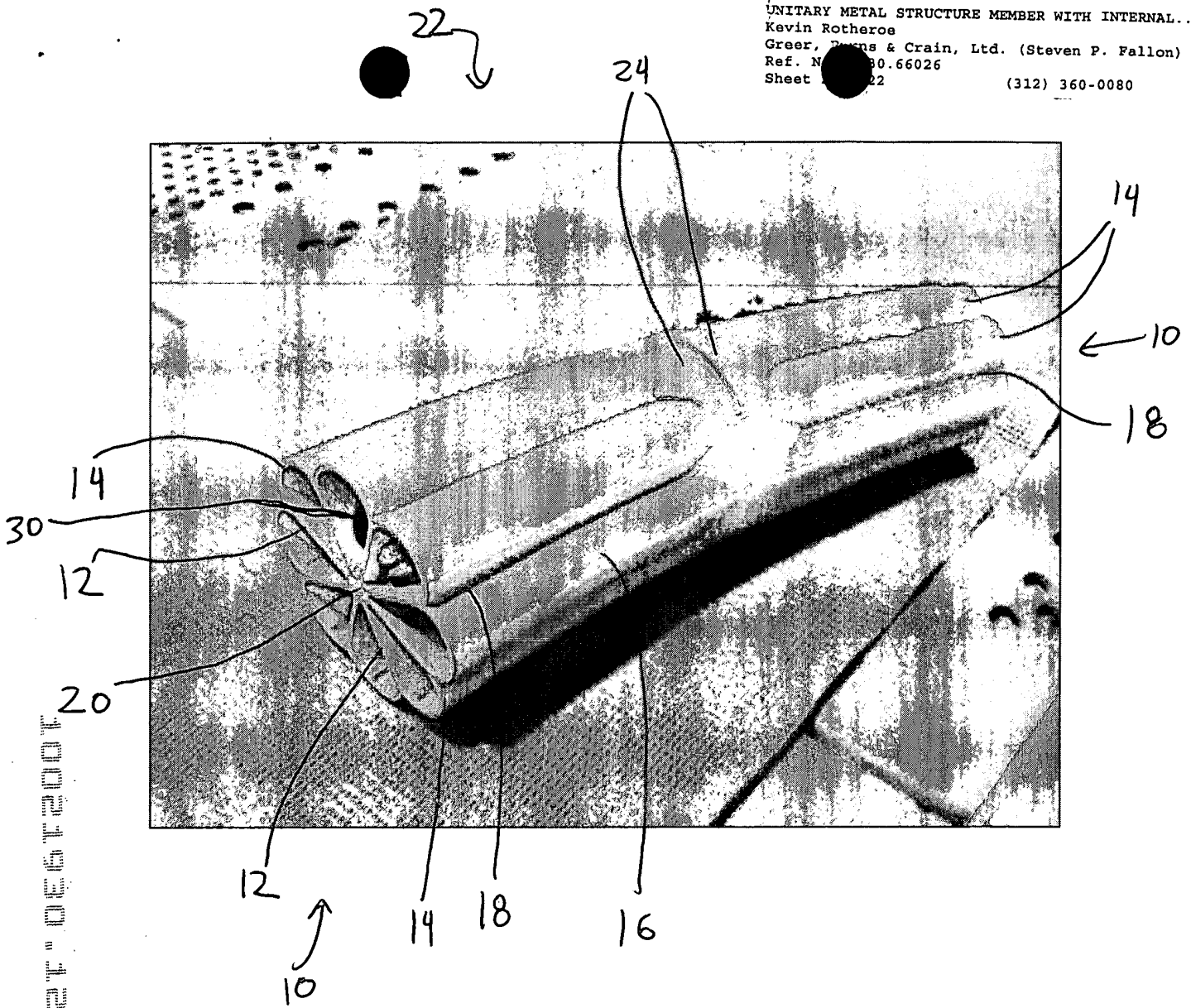


FIG. 2

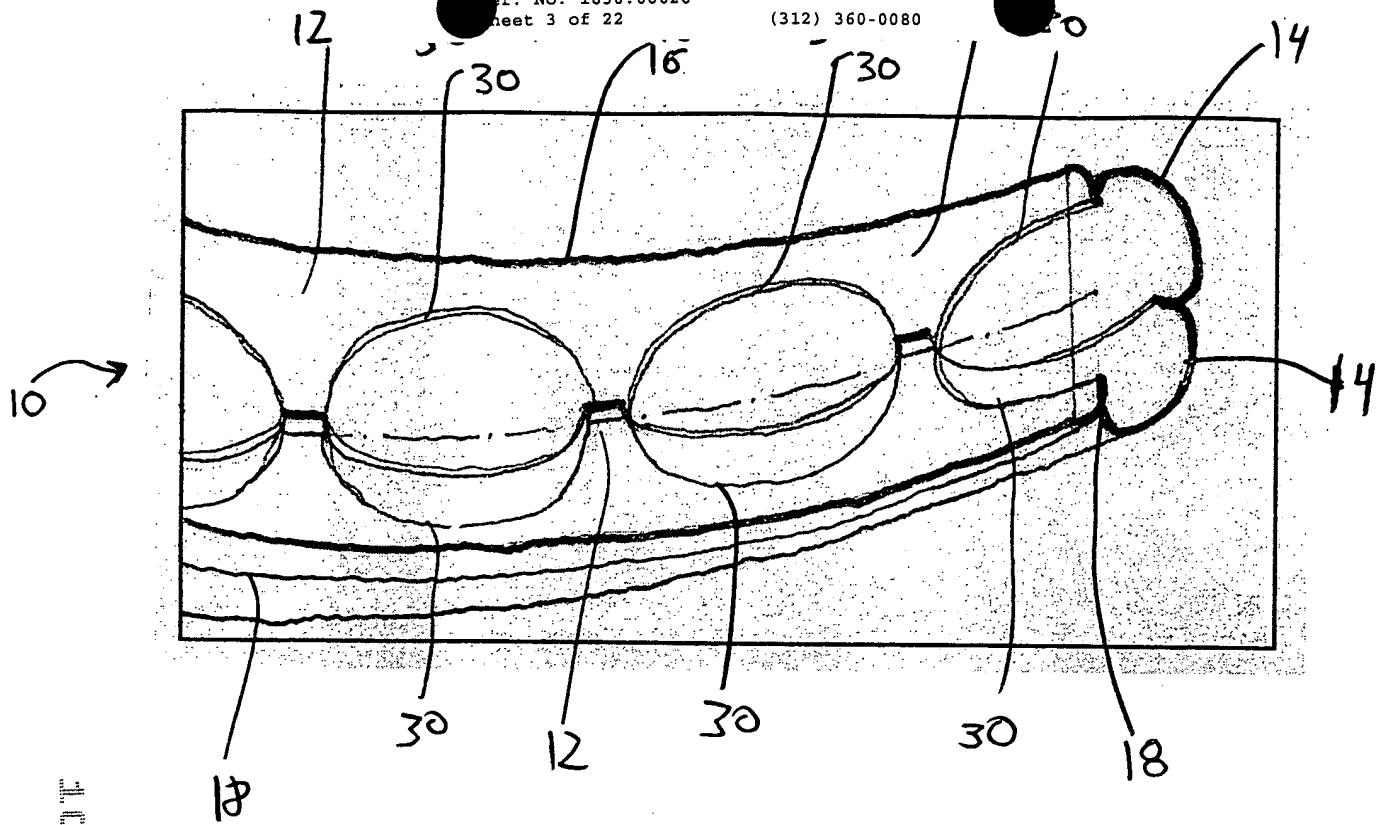


FIG. 3

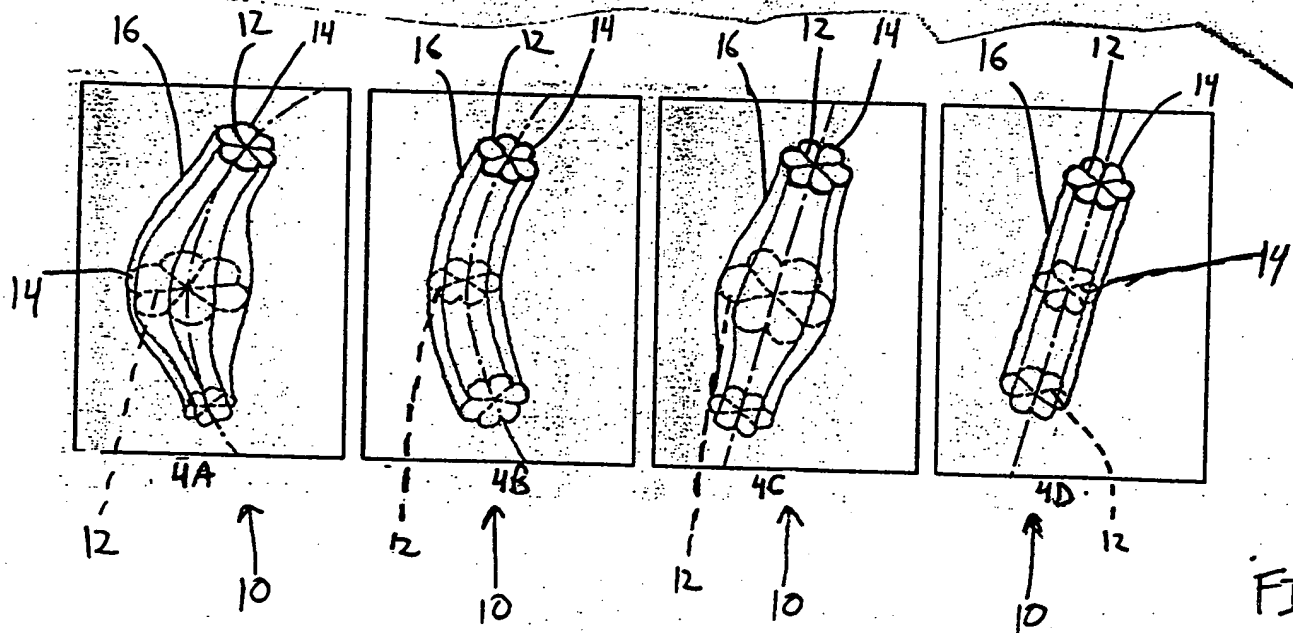
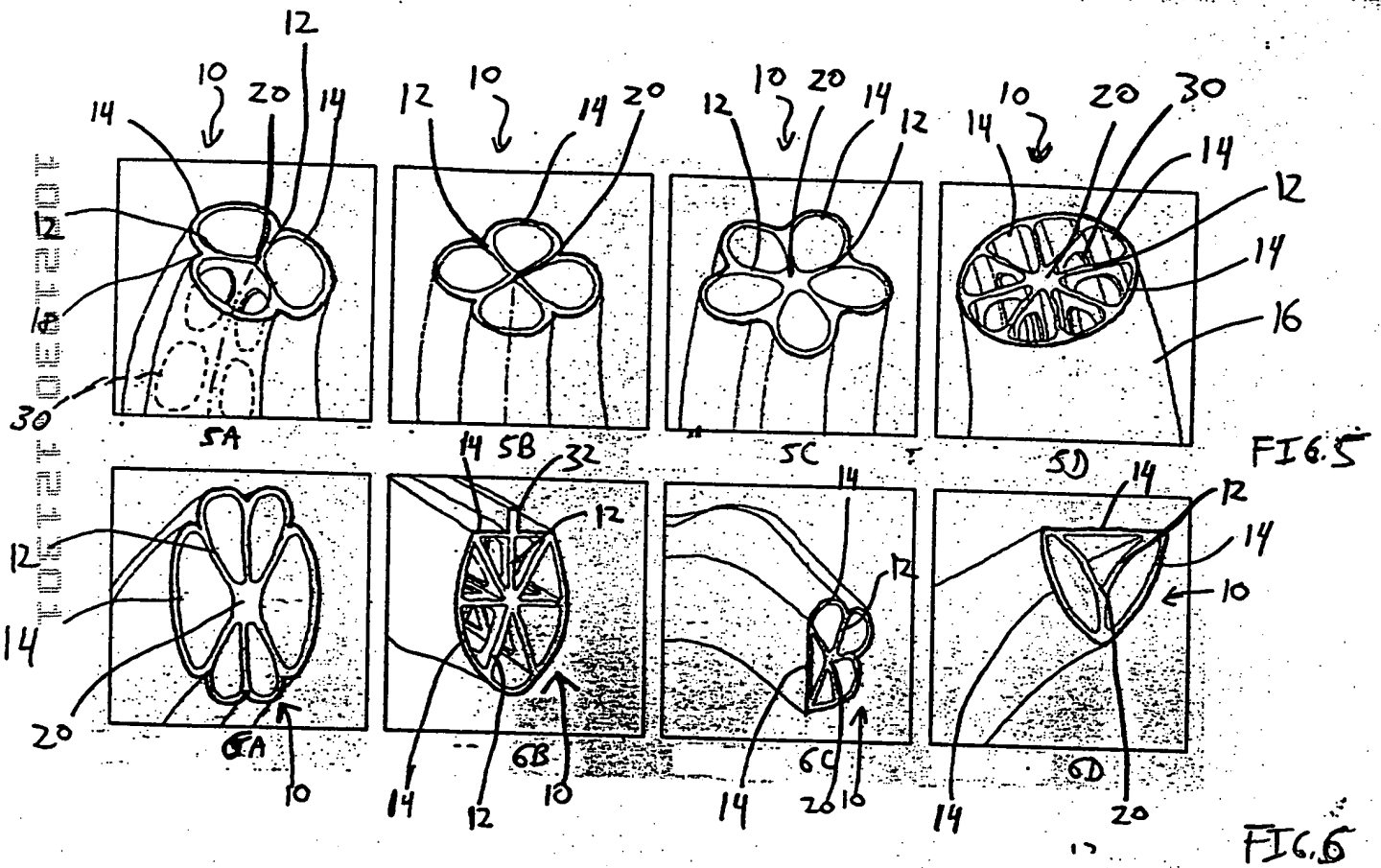
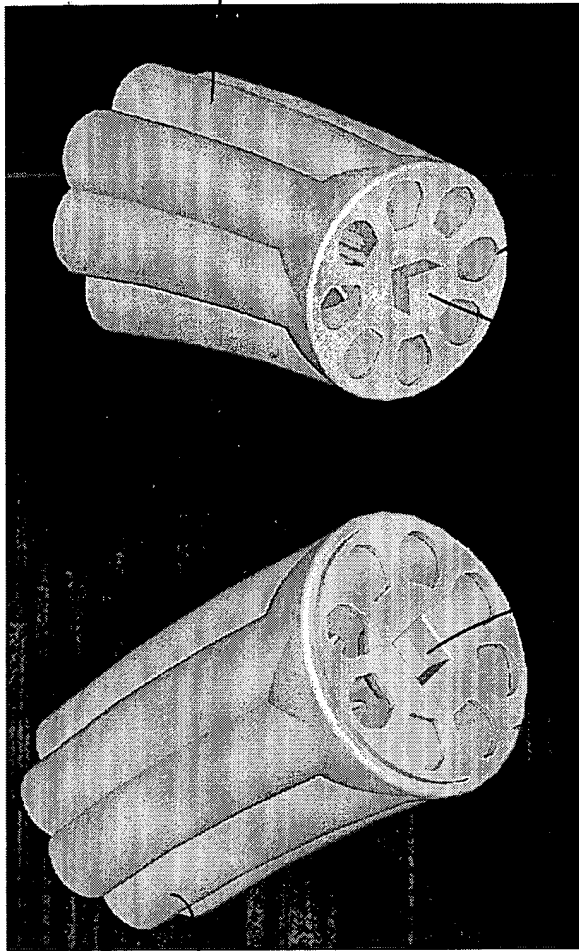


FIG. 4

FOOT OF DEEFOOT





10

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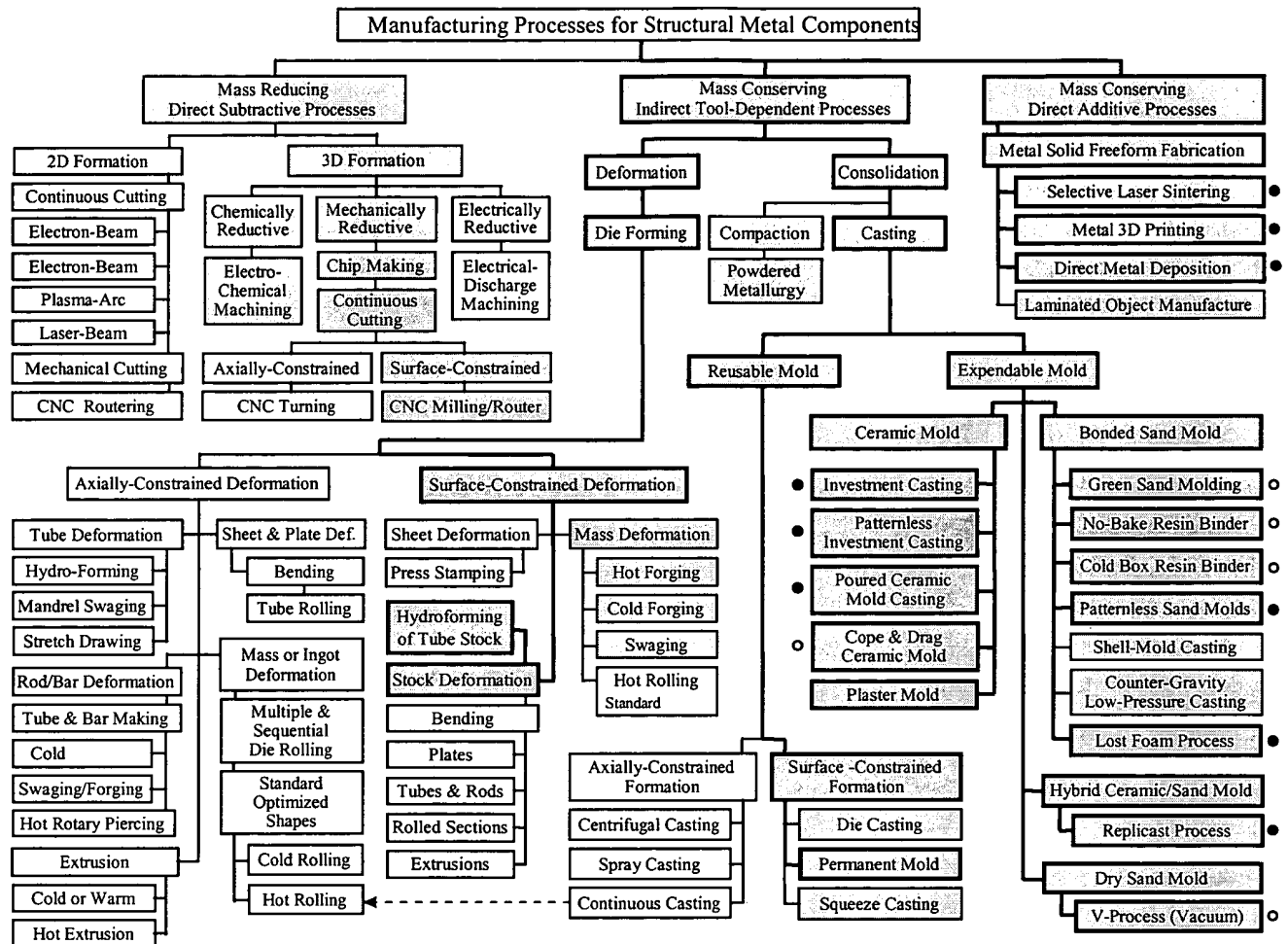
24

16

FIG. 7

UNITARY METAL STRUCTURE MEMBER WITH INTERNAL...

FIG. 8



- ☐ Process with Capacity to Produce Complexly-Shaped Solid Components.
- ☐ Process with Capacity to Produce Complexly-Shaped Tubular as well as Solid Components.
- ☐ Process with Capacity to Produce Complexly-Shaped Tubes with Very Limited Internal Features.
- ☐ Process with Capacity to Produce Complexly-Shaped Tubes with Extensive Internal Features.
- ☐ Process with No Capacity to Produce Complexly-Shaped Solid or Tubular Components.

Tooling Classification							Process Status	Fundamental Computer-Aided Manufacturing Processes for Complexly-Shaped Metal Structural Components:										Capacity to Produce Freeform Components:			Completely-Shaped Solids	Freeform Tubes	Tubes w/Internal Features
Hurd Die	Hurd Mold	Soft Mold	Expendable Mold	Hurd Pattern	Expendable Pattern	No Tooling												Capacity	Limited Capacity				
								Direct Production Processes:															
								1	3D Data	Additive Formation	Component												
								2	3D Data	Subtractive Formation	Component												
								Direct Expendable Mold Processes (Direct Tooling):															
								3	3D Data	Additive Formation	Expendable Mold	Component											
								4	3D Data	Subtractive Formation	Expendable Mold	Component											
								Indirect Expendable Mold Processes:															
								5	3D Data	Additive Formation	Expendable Pattern	Expendable Mold	Component										
								6	3D Data	Subtractive Formation	Expendable Pattern	Expendable Mold	Component										
								7	3D Data	Subtractive Formation	Permanent Mold	Expendable Pattern	Expendable Mold	Component									
								8	3D Data	Additive Formation	Net Shape Mold	Subtractive Formation	Permanent Mold	Expendable Pattern	Expendable Mold	Component							
								9	3D Data	Additive Formation	Master Pattern	Expendable Mold	Component										
								10	3D Data	Subtractive Formation	Master Pattern	Expendable Mold	Component										
								11	3D Data	Additive Formation	Master Pattern	Short-Life Mold	Expendable Pattern	Expendable Mold	Component								
								12	3D Data	Subtractive Formation	Master Pattern	Short-Life Mold	Expendable Pattern	Expendable Mold	Component								
								Direct Permanent Mold Production Processes:															
								13	3D Data	Additive Formation	Permanent Mold	Component											
								14	3D Data	Additive Formation	Net Shape Mold	Subtractive Formation	Permanent Mold	Component									
								15	3D Data	Subtractive Formation	Permanent Mold	Component											
								Direct Permanent Die Production Processes:															
								16	3D Data	Additive Formation	Permanent Die Set	Component											
								17	3D Data	Additive Formation	Net Shape Die Set	Subtractive Formation	Permanent Die Set	Component									
								18	3D Data	Subtractive Formation	Permanent Die Set	Component											
								Indirect Permanent Die Production Processes:															
								19	3D Data	Additive Formation	Expendable Pattern	Expendable Mold	Net Shape Die Set	Subtractive Formation	Permanent Die Set	Component							
								20	3D Data	Subtractive Formation	Expendable Pattern	Expendable Mold	Net Shape Die Set	Subtractive Formation	Permanent Die Set	Component							
								21	3D Data	Subtractive Formation	Expendable Mold	Net Shape Die Set	Subtractive Formation	Permanent Die Set	Component								
								22	3D Data	Additive Formation	Master Pattern	Expendable Mold	Net Shape Die Set	Subtractive Formation	Permanent Die Set	Component							
								23	3D Data	Subtractive Formation	Master Pattern	Expendable Mold	Net Shape Die Set	Subtractive Formation	Permanent Die Set	Component							

TOP SECRET

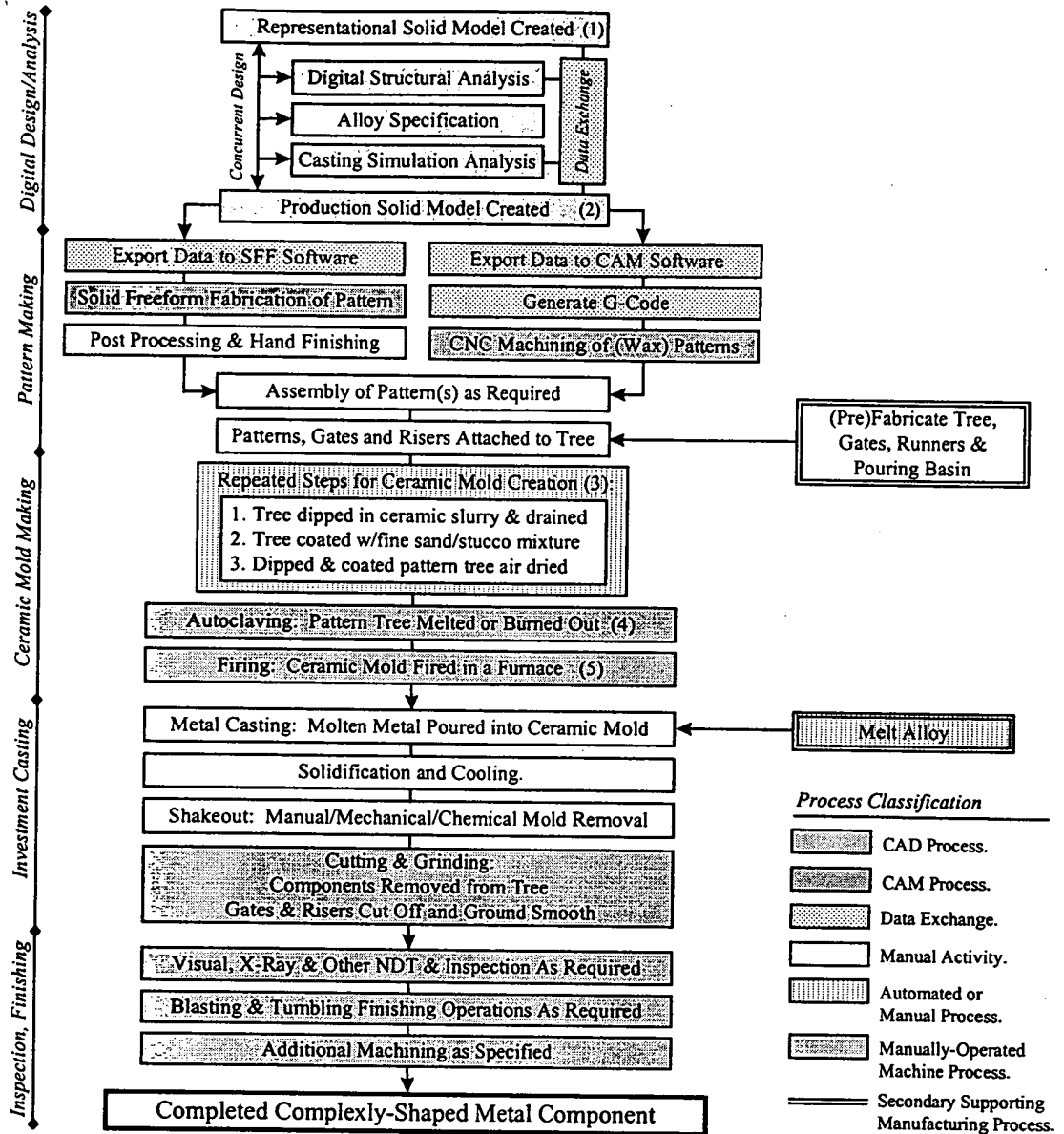


FIG 10

Finish & Inspect Post-Processing Casting Ceramic Mold Making Pattern Making Data Transfer Digital Design

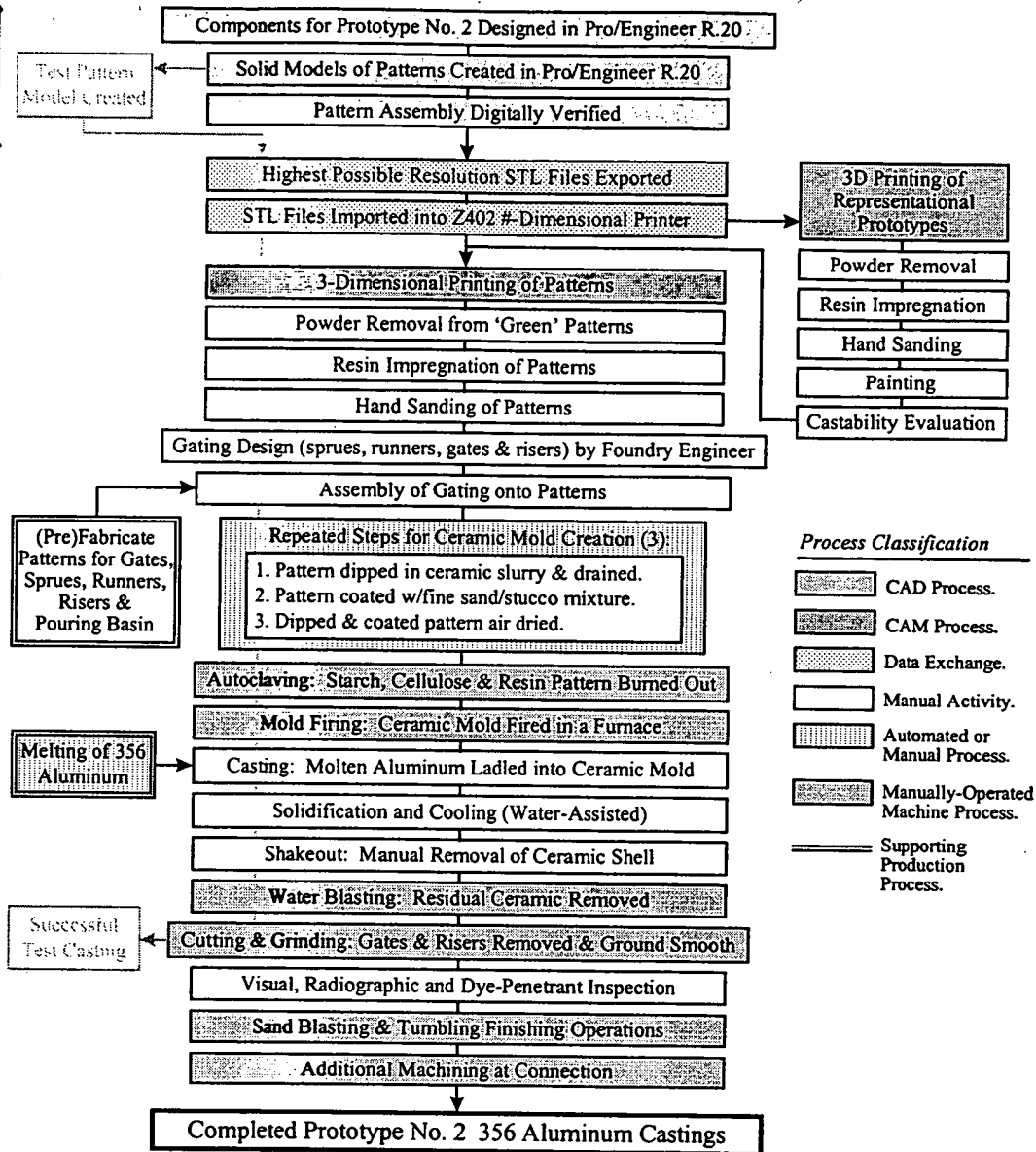


FIG 11

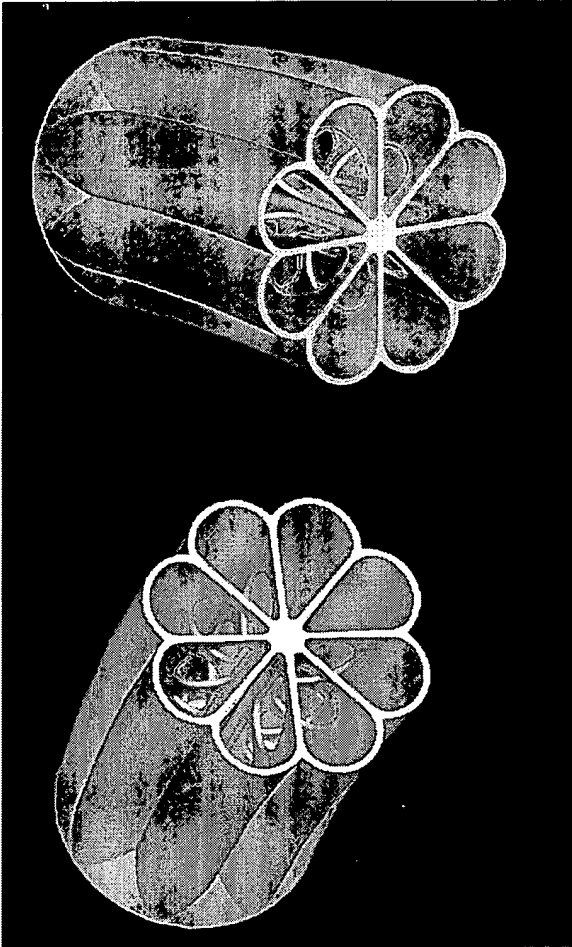


FIG. 12

FIG. 12

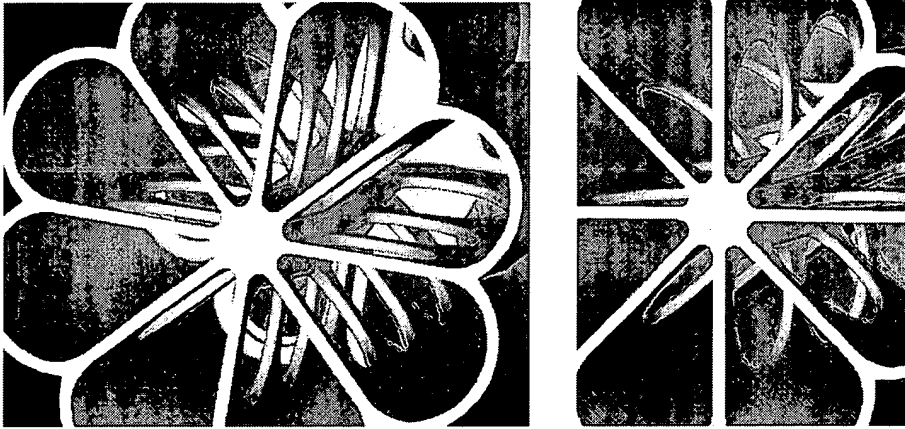


FIG. 13

10024930-13101

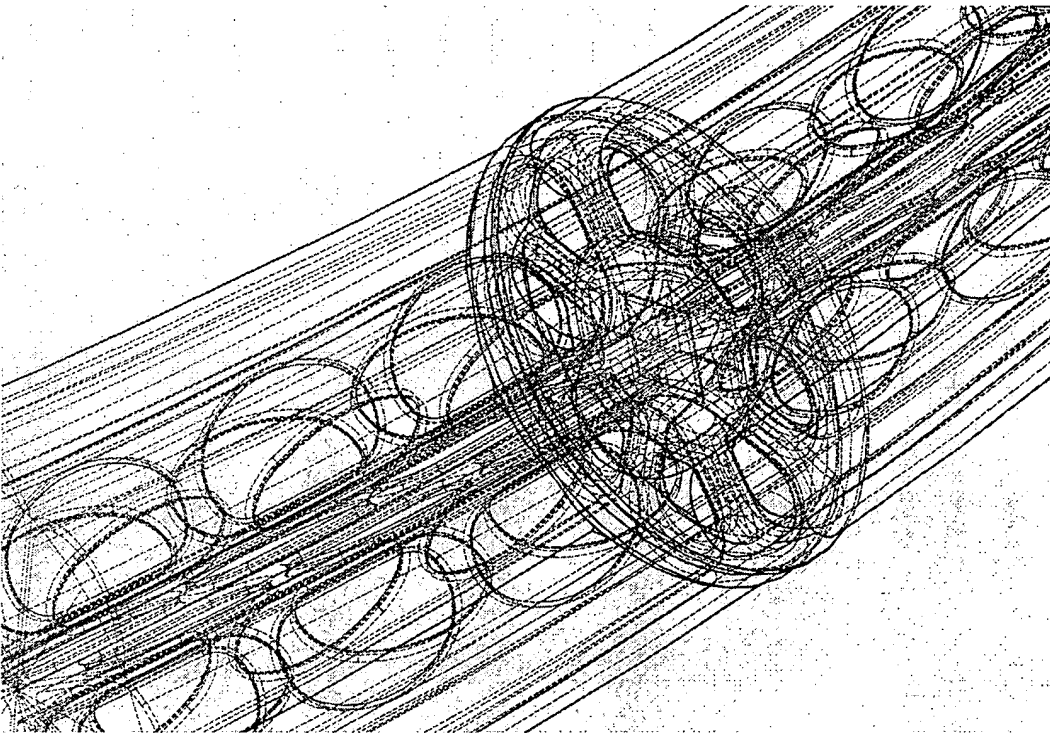
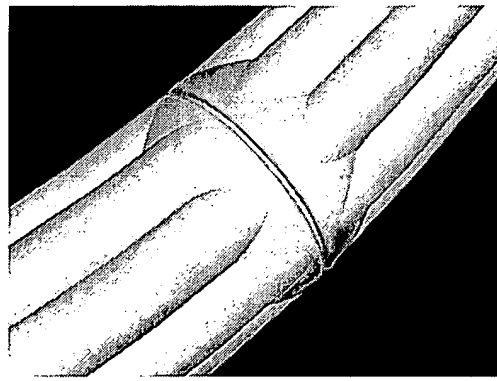
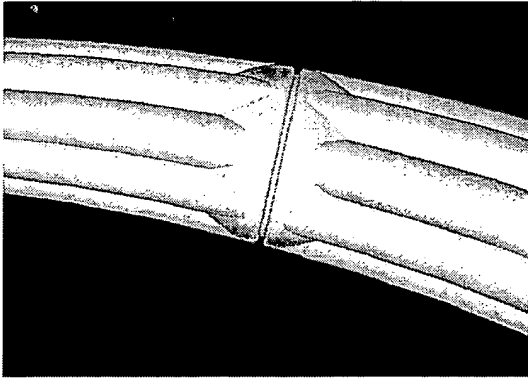


FIG. 14

10021930-124301

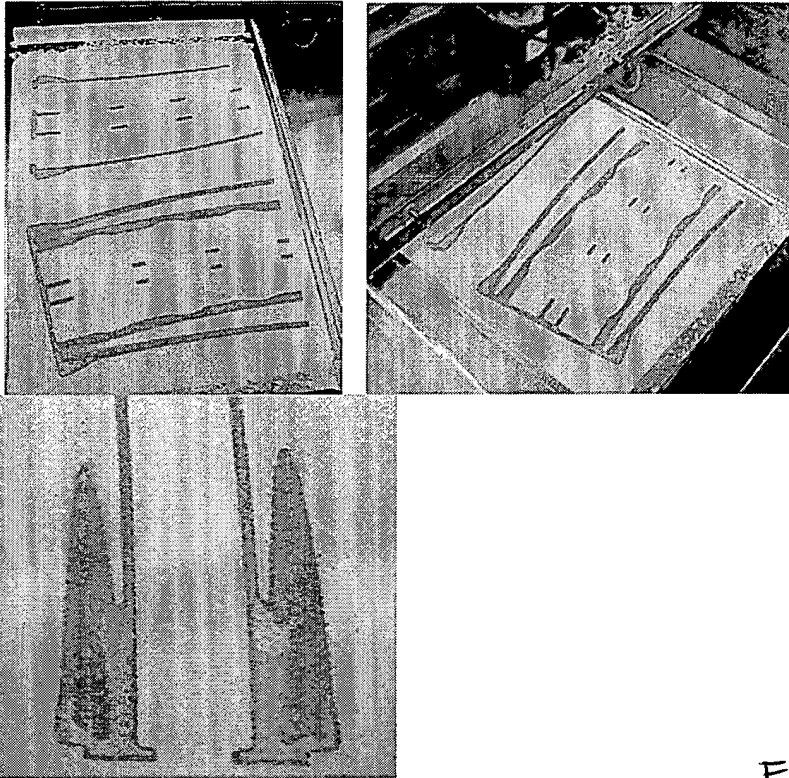


FIG 15

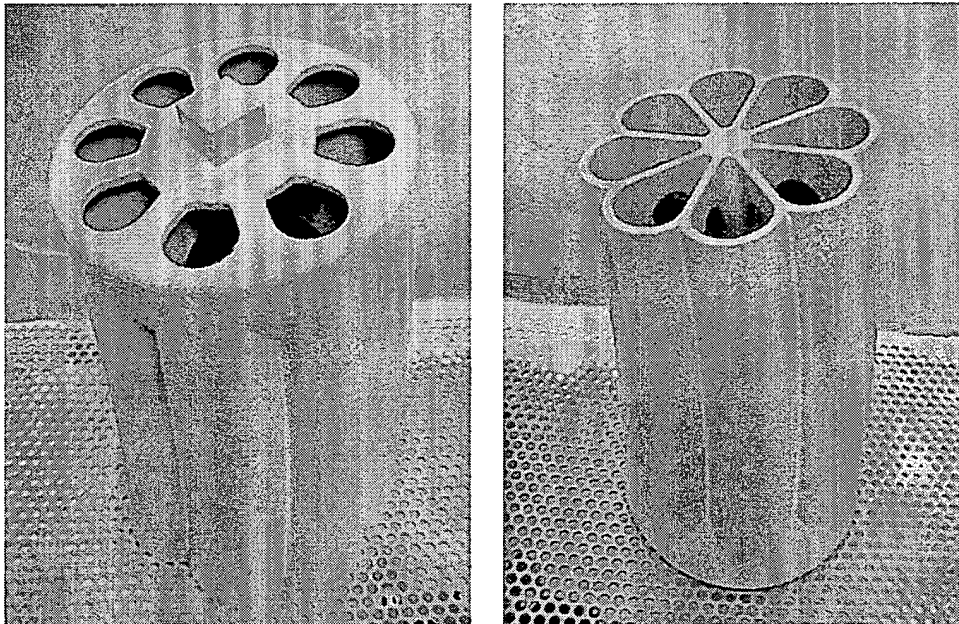


FIG. 16

1830.66026-14

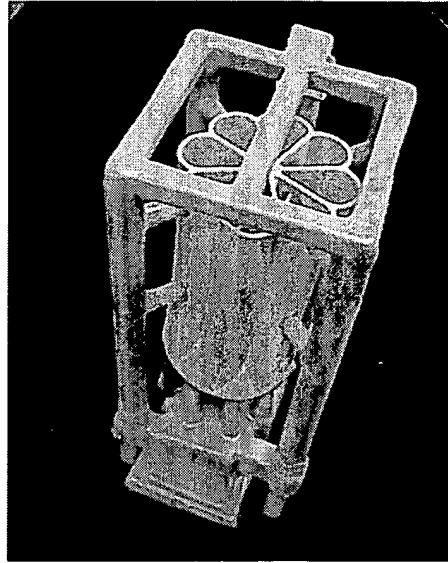
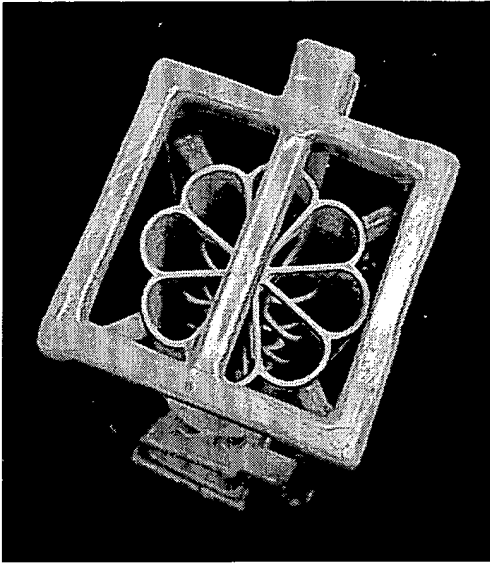


FIG. 17



FIG. 18

FIG. 16

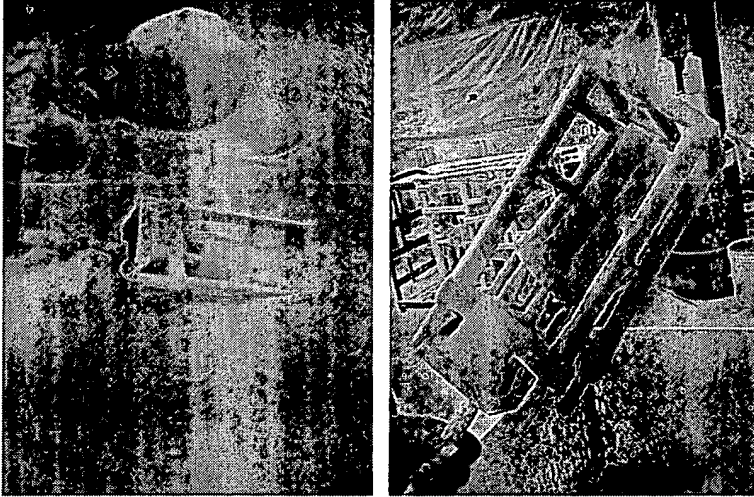


FIG. 19

10021530 121301

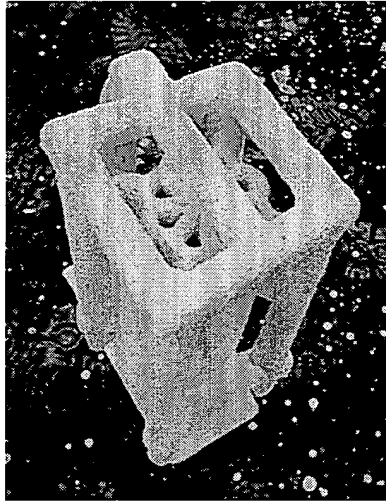
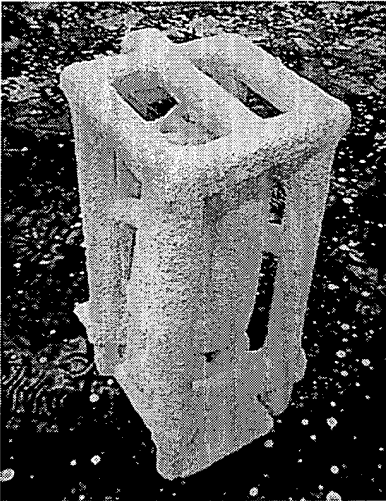
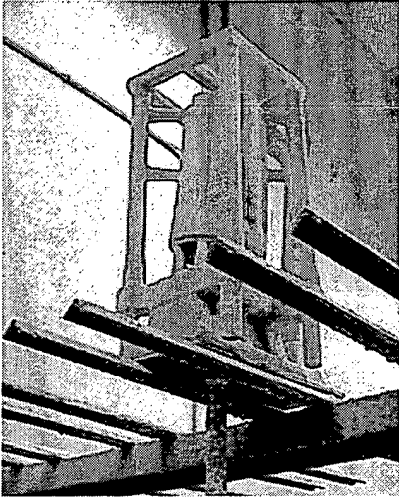


FIG. 20



FIG. 21

FIG. 19

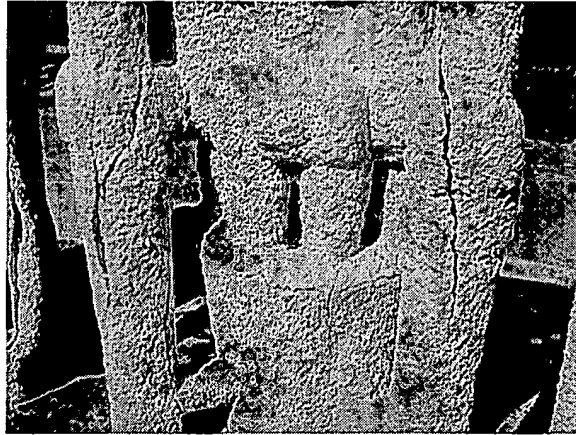


FIG. 22

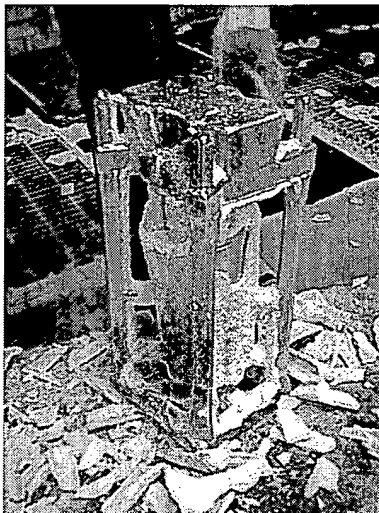
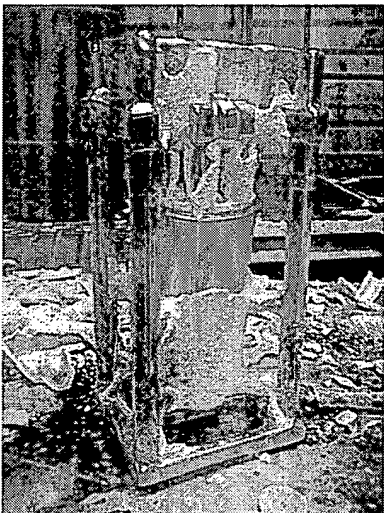


FIG. 23

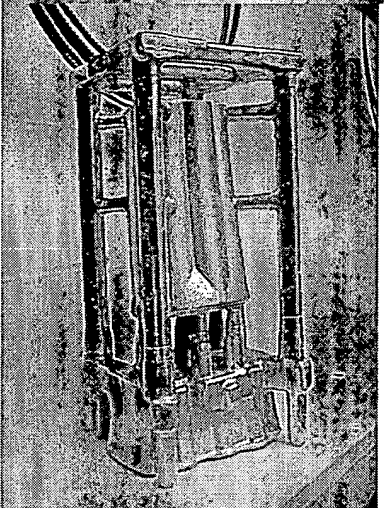


FIG. 24

FIG. 22

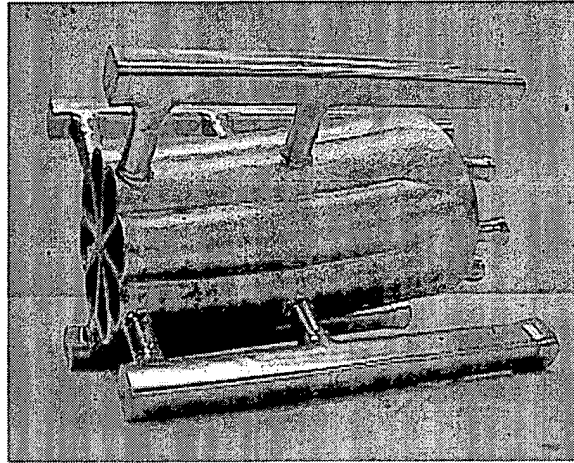
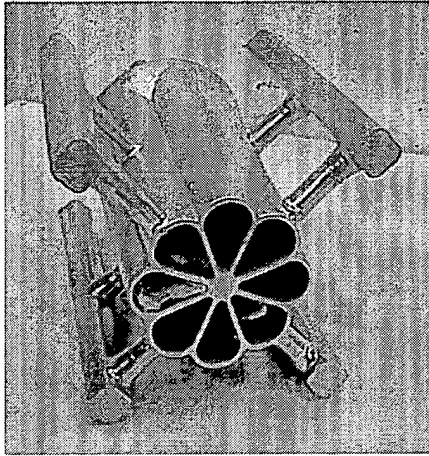


FIG. 25

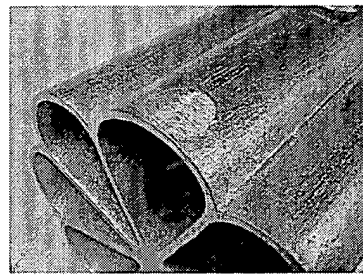
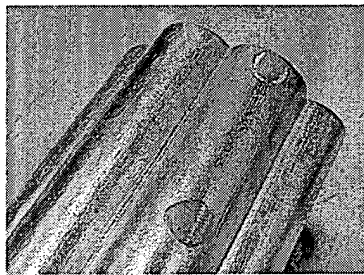
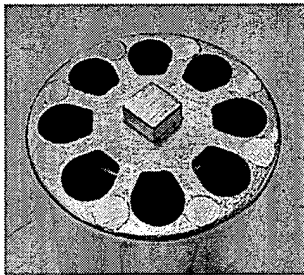


FIG. 26

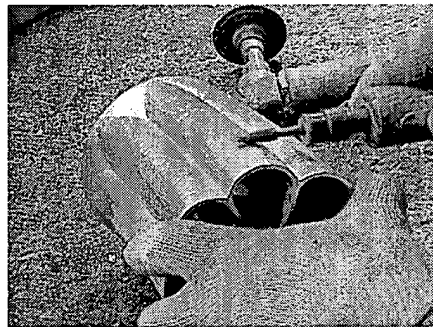
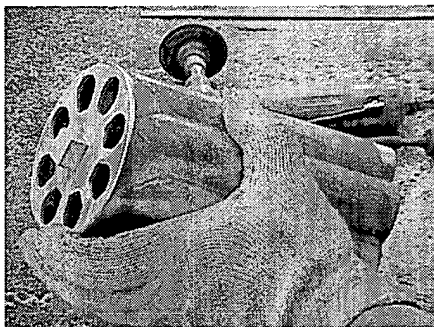


FIG. 27

10049304.133
FIG. 27

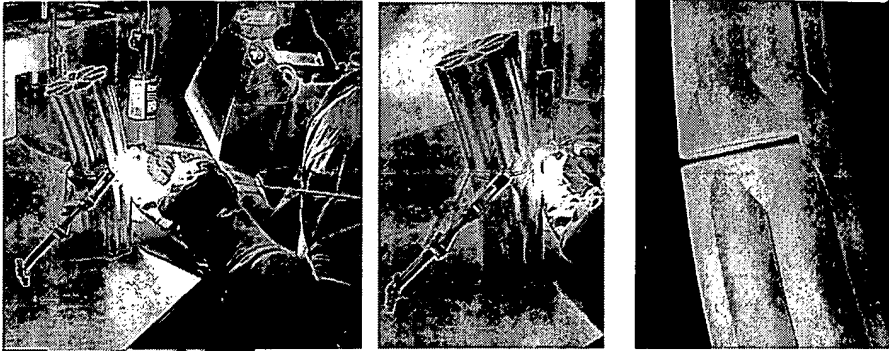


FIG. 28

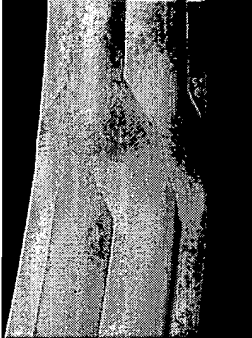


FIG. 29

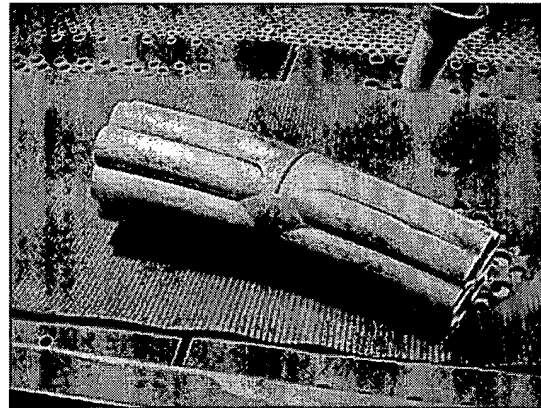
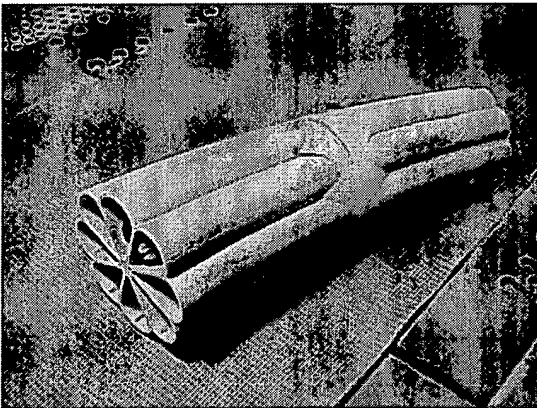
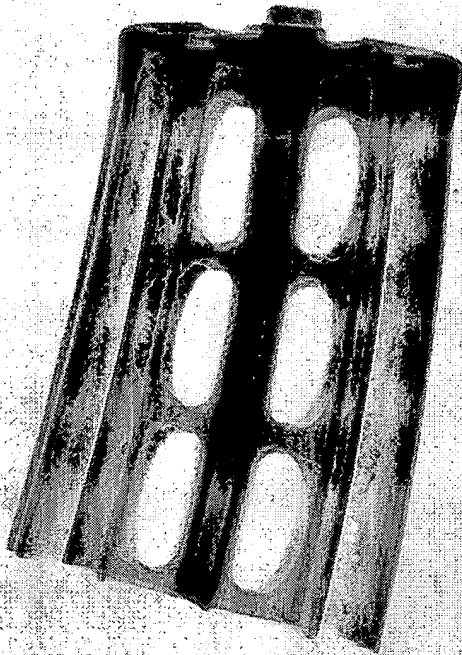


FIG. 30

UNITARY METAL STRUCTURE MEMBER WITH INTERNAL



31A



31B

FIG. 31

10024930 12101

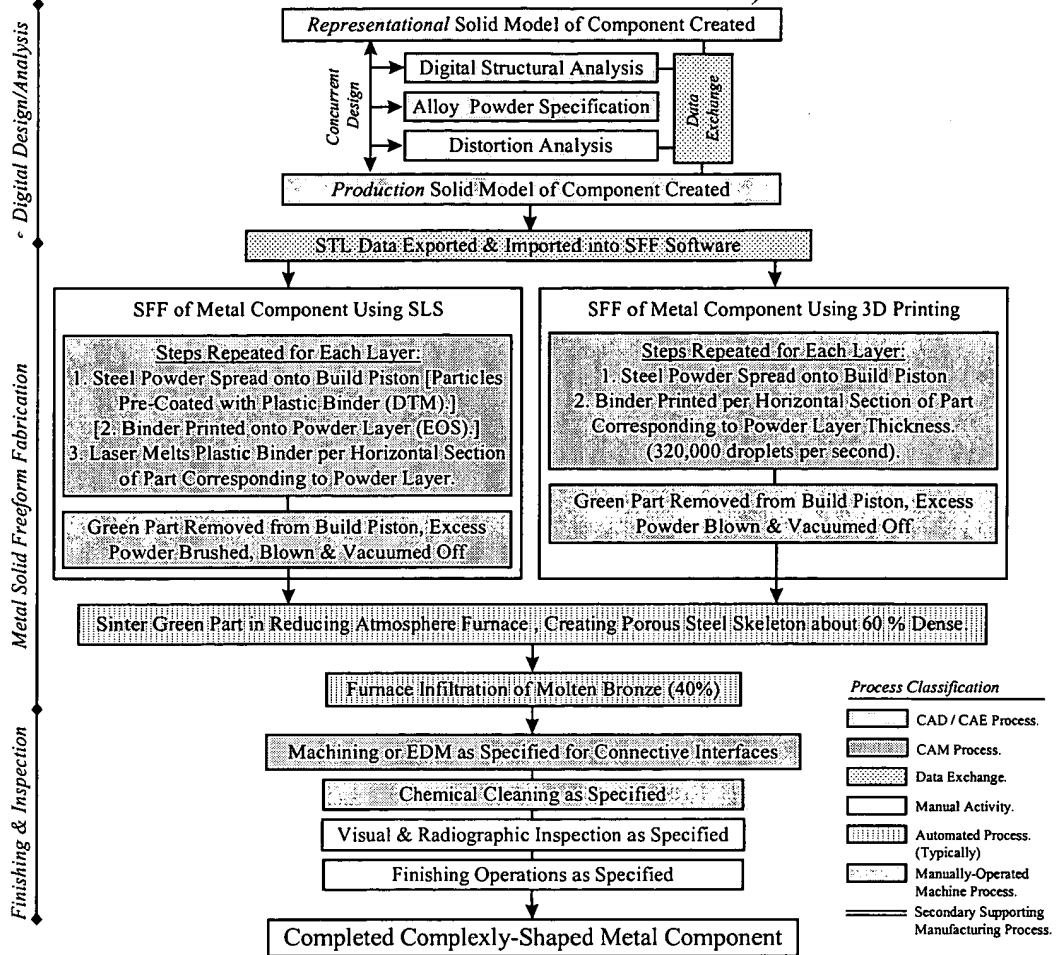


FIG. 32